3.

$$\int \theta^{1/2} - \csc^2\theta \, d\theta$$

$$y = \frac{2}{3}\theta^{3/2} + \cot\theta + C$$

4. $\int \frac{x^3 - 5}{x^2} dx = \int \left(\frac{x^3}{x^2} - \frac{5}{x^2}\right) dx$

$\int x - 5x^{-2} dx$

$$\int \frac{\cos^3 x - 5}{\cos^2 x}\,dx = \int \frac{\cos^3 x}{\cos^2 x} - \frac{5}{\cos^2 x}\,dx$$

$$\int (\cos x - 5\sec^2 x)\,dx$$

$$\frac{1}{\cos^2 x} = \sec^2 x$$

$$y = \sin x - 5\tan x + C$$

7. $\int \frac{\sin 2x}{\cos x}\,dx = \int \frac{2\sin x \cancel{\cos x}}{\cancel{\cos x}}\,dx$

$\int 2\sin x\,dx$

$y = -2\cos x + C$

$$\int \frac{1}{1+\sin x} \cdot \frac{1-\sin x}{1-\sin x}\, dx$$

$$\int \frac{1-\sin x}{1-\sin^2 x}\, dx$$

$$\int \frac{1-\sin x}{\cos^2 x}\, dx =$$

$$\int \frac{1-\sin^2 x}{\cos^2 x}\,dx =$$

$$\int \left(\frac{1}{\cos^2 x} - \frac{\sin x}{\cos^2 x}\right) dx =$$

$$\int \sec^2 x - \frac{1}{\cos x}\cdot\frac{\sin x}{\cos x}\,dx$$

$$\int \sec^2 x - \sec x \tan x\,dx$$

$$\tan x - \sec x + C$$

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Integration by Substitution

$$\int u^n \, du = \frac{u^{n+1}}{n+1} + C$$

$u = x - 3$

$du = dx$

$\frac{du}{dx} = 1$

$$\int (x-3)^4 \, dx = \int u^4 \, du = \frac{u^5}{5} + C$$

$$= \frac{(x-3)^5}{5} + C$$

$$y = \frac{(x-3)^5}{5} + c$$

$$\frac{dy}{dx} = \frac{5}{5}(x-3)^4 \cdot 1$$

$$\int \sqrt{3x+2}\,dx = \int (3x+2)^{1/2}\,dx$$

$u = 3x+2$

$du = 3dx \Rightarrow \frac{du}{3} = dx$

$\frac{du}{dx} = 3$

$$= \int u^{1/2}\,\frac{du}{3}$$

$$= \frac{1}{3}\int u^{1/2}\,du$$

$$= \frac{1}{3}\cdot\frac{2}{3}u^{3/2} + C$$

$$= \frac{2}{9}u^{3/2} + C$$

$$y = \frac{2}{9}(3x+2)^{3/2} + C$$

$$\frac{dy}{dx} = \frac{2}{9}\cdot\frac{3}{2}(3x+2)^{\frac{1}{2}}\cdot 3$$

$$\int x^2 dx = \frac{x^3}{3} + C$$

$$\int \underline{x^3}\sqrt{x^4+2}\ \underline{dx} = \int (x^3)(x^4+2)^{\frac{1}{2}}(dx)$$

$u = x^4+2$

$du = 4x^3\,dx$

$\frac{du}{4} = x^3\,dx$

$$= \int u^{1/2}\,\frac{du}{4}$$

$$= \frac{1}{4}\int u^{1/2}\,du$$

$$= \frac{1}{4}\cdot\frac{2}{3}u^{3/2} + C$$

$$= \frac{1}{6}(x^4+2)^{3/2} + C$$

$$\int \sin 2x\,dx = \int \sin u \cdot \frac{du}{2}$$

$u = 2x$

$du = 2dx$

$\frac{du}{2} = dx$

$$= \frac{1}{2}\int \sin u\,du$$

$$= -\frac{1}{2}\cos u + C$$

$$y = -\frac{1}{2}\cos 2x + C$$

$$\frac{dy}{dx} = +\frac{1}{2} \cdot (+\sin 2x) \cdot 2$$

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